

#5

SEQUENCE LISTING



<110> Her Majesty The Queen In Right Of Canada, As Represented By The
Ministry Of Agriculture; Agri-Food Canada Both Of Canada

Harris, Linda J.
Gleddie, Stephen C.

<120> Tolerance Of Trichothecene Mycotoxins In Plants Through The
Modification Of The Ribosomal Protein L3 Gene

<130> 08-874401US2

<140> US 09/725,957

<141> 2000-11-30

<150> US 09/567,326

<151> 2000-05-09

<150> US 08/909,828

<151> 1997-08-12

<160> 18

<170> PatentIn version 3.0

<210> 1

<211> 350

<212> PRT

<213> *Saccharomyces cerevisiae* (wild-type)

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Pro Lys Asp Asp Arg Ser Lys Pro Val Ala Leu Thr Ser Phe Leu Gly
35 40 45

Tyr Lys Ala Gly Met Thr Thr Ile Val Arg Asp Leu Asp Arg Pro Gly
50 55 60

Ser Lys Phe His Lys Arg Glu Val Val Glu Ala Val Thr Val Val Asp
65 70 75 80

Thr Pro Pro Val Val Val Val Gly Val Val Gly Tyr Val Glu Thr Pro
85 90 95

Arg Gly Leu Arg Ser Leu Thr Thr Val Trp Ala Glu His Leu Ser Asp
100 105 110

Glu Val Lys Arg Arg Phe Tyr Lys Asn Trp Tyr Lys Ser Lys Lys Lys
115 120 125

Ala Phe Thr Lys Tyr Ser Ala Lys Tyr Ala Gln Asp Gly Ala Gly Ile
130 135 140

Glu Arg Glu Leu Ala Arg Ile Lys Lys Tyr Ala Ser Val Val Arg Val

145		150		155		160
Leu Val His Thr Gln Ile Arg Lys Thr Pro Leu Ala Gln Lys Lys Ala						
		165		170		175
His Leu Ala Glu Ile Gln Leu Asn Gly Gly Ser Ile Ser Glu Lys Val						
		180		185		190
Asp Trp Ala Arg Glu His Phe Glu Lys Thr Val Ala Val Asp Ser Val						
		195		200		205
Phe Glu Gln Asn Glu Met Ile Asp Ala Ile Ala Val Thr Lys Gly His						
		210		215		220
Gly Phe Glu Gly Val Thr His Arg Trp Gly Thr Lys Lys Leu Pro Arg						
		225		230		235
Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly Ala Trp His						
		245		250		255
Pro Ala His Val Met Trp Ser Val Ala Arg Ala Gly Gln Arg Gly Tyr						
		260		265		270
His Ser Arg Thr Ser Ile Asn His Lys Ile Tyr Arg Val Gly Lys Gly						
		275		280		285
Asp Asp Glu Ala Asn Gly Ala Thr Ser Phe Asp Arg Thr Lys Lys Thr						
		290		295		300
Ile Thr Pro Met Gly Gly Phe Val His Tyr Gly Glu Ile Lys Asn Asp						
		305		310		315
Phe Ile Met Val Lys Gly Cys Ile Pro Gly Asn Arg Lys Arg Ile Val						
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Thr Leu Arg Lys Ser Leu Tyr Thr Asn Thr Ser Arg Lys Ala						
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 <212> PRT
 <213> *Saccharomyces cerevisiae* (trichodermin-resistant)

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Pro Lys Asp Asp Arg Ser Lys Pro Val Ala Leu Thr Ser Phe Leu Gly						
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Tyr Lys Ala Gly Met Thr Thr Ile Val Arg Asp Leu Asp Arg Pro Gly						
		50		55		60
Ser Lys Phe His Lys Arg Glu Val Val Glu Ala Val Thr Val Val Asp						
		65		70		75
						80

Thr Pro Pro Val Val Val Val Gly Val Val Gly Tyr Val Glu Thr Pro
 85 90 95
 Arg Gly Leu Arg Ser Leu Thr Thr Val Trp Ala Glu His Leu Ser Asp
 100 105 110
 Glu Val Lys Arg Arg Phe Tyr Lys Asn Trp Tyr Lys Ser Lys Lys Lys
 115 120 125
 Ala Phe Thr Lys Tyr Ser Ala Lys Tyr Ala Gln Asp Gly Ala Gly Ile
 130 135 140
 Glu Arg Glu Leu Ala Arg Ile Lys Lys Tyr Ala Ser Val Val Arg Val
 145 150 155 160
 Leu Val His Thr Gln Ile Arg Lys Thr Pro Leu Ala Gln Lys Lys Ala
 165 170 175
 His Leu Ala Glu Ile Gln Leu Asn Gly Gly Ser Ile Ser Glu Lys Val
 180 185 190
 Asp Trp Ala Arg Glu His Phe Glu Lys Thr Val Ala Val Asp Ser Val
 195 200 205
 Phe Glu Gln Asn Glu Met Ile Asp Ala Ile Ala Val Thr Lys Gly His
 210 215 220
 Gly Phe Glu Gly Val Thr His Arg Trp Gly Thr Lys Lys Leu Pro Arg
 225 230 235 240
 Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly Ala Cys His
 245 250 255
 Pro Ala His Val Met Trp Ser Val Ala Arg Ala Gly Gln Arg Gly Tyr
 260 265 270
 His Ser Arg Thr Ser Ile Asn His Lys Ile Tyr Arg Val Gly Lys Gly
 275 280 285
 Asp Asp Glu Ala Asn Gly Ala Thr Ser Phe Asp Arg Thr Lys Lys Thr
 290 295 300
 Ile Thr Pro Met Gly Gly Phe Val His Tyr Gly Glu Ile Lys Asn Asp
 305 310 315 320
 Phe Ile Met Val Lys Gly Cys Ile Pro Gly Asn Arg Lys Arg Ile Val
 325 330 335
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 340 345 350

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 <211> 389
 <212> PRT
 <213> Orzya sativa

<400> 3

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 Pro Lys Asp Asp Val Ser Lys Pro Cys His Leu Thr Ser Phe Val Gly
 35 40 45
 Tyr Lys Ala Gly Met Thr His Ile Val Arg Glu Val Glu Lys Pro Gly
 50 55 60
 Ser Lys Leu His Lys Lys Glu Thr Cys Glu Ala Val Thr Ile Ile Glu
 65 70 75 80
 Thr Pro Pro Leu Val Ile Val Gly Leu Val Ala Tyr Val Lys Thr Pro
 85 90 95
 Arg Gly Leu Arg Ser Leu Asn Ser Val Trp Ala Gln His Leu Ser Glu
 100 105 110
 Glu Val Arg Arg Arg Phe Tyr Lys Asn Trp Cys Lys Ser Lys Lys Lys
 115 120 125
 Ala Phe Thr Lys Tyr Ala Leu Lys Tyr Asp Ser Asp Ala Gly Lys Lys
 130 135 140
 Glu Ile Gln Met Gln Leu Glu Lys Met Lys Lys Tyr Ala Ser Ile Val
 145 150 155 160
 Arg Val Ile Ala His Thr Gln Ile Arg Lys Met Lys Gly Leu Lys Gln
 165 170 175
 Lys Lys Ala His Leu Met Glu Ile Gln Ile Asn Gly Gly Thr Ile Ala
 180 185 190
 Asp Lys Val Asp Tyr Gly Tyr Lys Phe Phe Glu Lys Glu Ile Pro Val
 195 200 205
 Asp Ala Val Phe Gln Lys Asp Glu Met Ile Asp Ile Ile Gly Val Thr
 210 215 220
 Lys Gly Lys Gly Tyr Glu Gly Val Val Thr Arg Trp Gly Val Thr Arg
 225 230 235 240
 Leu Pro Arg Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly
 245 250 255
 Ala Trp His Pro Ala Arg Val Ser Tyr Thr Val Ala Arg Ala Gly Gln
 260 265 270
 Asn Gly Tyr His His Arg Thr Glu Met Asn Lys Lys Val Tyr Lys Ile
 275 280 285
 Gly Lys Ser Gly Gln Glu Ser His Ala Ala Cys Thr Glu Phe Asp Arg
 290 295 300
 Thr Glu Lys Asp Ile Thr Pro Met Gly Gly Phe Pro His Tyr Gly Val
 305 310 315 320
 Val Lys Gly Asp Tyr Leu Met Ile Lys Gly Cys Cys Val Gly Pro Lys
 325 330 335

Lys Arg Val Val Thr Leu Arg Gln Ser Leu Leu Lys Gln Thr Ser Arg
340 345 350

Leu Ala Leu Glu Glu Ile Lys Leu Lys Phe Ile Asp Thr Ser Ser Lys
355 360 365

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Gly Lys Leu Lys Ala
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<213> Artificial

<220>
<223> Oligomer

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<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer

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<210> 6
<211> 18
<212> DNA
<213> Artificial

<220>
<223> Primer

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<210> 7
<211> 1281
<212> DNA
<213> Zea mays

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tgccatctca ctgccttcct tggctacaag gctggcatga ctcacattgt ccgtgaggtt 180

gagaagccag gatccaaact ccataagaag gaaacttgtg aggctgttac catcattgaa 240
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 atggttcggg cacggtcgct t 1281

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 <212> DNA
 <213> Zea mays

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 tgccatctca ctgccttcct tggctacaag gctggcatga ctcacattgt ccgtgaggtt 180
 gagaagccag gatccaaact ccataagaag gaaacttgtg aggctgttac catcattgaa 240
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 <211> 1144
 <212> DNA
 <213> Avena sativa

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 cgccttcccc gcaagacca cagaggtctc cgcaagggtg cctgcattgg tgcttggcat 600
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<210> 10

<211> 1319

<212> DNA

<213> Hordeum vulgare

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 <211> 587
 <212> DNA
 <213> Sorghum vulgare

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 <213> Sorghum vulgare

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 gcaaattctg 1330

<210> 13
 <211> 1344
 <212> DNA
 <213> *Triticum aestivum*

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<210> 14
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<400> 14

Met Ser His Arg Lys Phe Glu His Pro Arg His Gly Ser Leu Gly Phe
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 35 40 45
 Tyr Lys Ala Gly Met Thr His Ile Val Arg Glu Val Glu Lys Pro Gly
 50 55 60
 Ser Lys Leu His Lys Lys Glu Thr Cys Glu Ala Val Thr Ile Ile Glu
 65 70 75 80
 Thr Pro Pro Leu Val Ile Val Gly Leu Val Ala Tyr Val Lys Thr Pro
 85 90 95
 Arg Gly Leu Arg Thr Leu Asn Ser Val Trp Ala Gln His Leu Ser Glu
 100 105 110
 Glu Val Arg Arg Arg Phe Tyr Lys Asn Trp Cys Lys Ser Lys Lys Lys
 115 120 125
 Ala Phe Thr Lys Tyr Ala Leu Lys Tyr Glu Asn Asp Ala Gly Lys Lys
 130 135 140
 Glu Ile Gln Leu Gln Leu Glu Lys Met Lys Lys Tyr Ala Ser Val Ile
 145 150 155 160
 Arg Val Ile Ala His Thr Gln Ile Arg Lys Met Lys Gly Leu Lys Gln

165																170							175						
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		210						215				220																	
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225						230				235																			
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			245						250																				
Ala	Trp	His	Pro	Ala	Arg	Val	Ser	Tyr	Thr	Val	Ala	Arg	Ala	Gly	Gln														
			260						265																				
Asn	Gly	Tyr	His	His	Arg	Thr	Glu	Met	Asn	Lys	Lys	Val	Tyr	Lys	Ile														
		275						280					285																
Gly	Lys	Ala	Gly	Gln	Glu	Thr	His	Asp	Ala	Ser	Thr	Glu	Phe	Asp	Arg														
		290						295					300																
Thr	Glu	Lys	Asp	Ile	Thr	Pro	Met	Gly	Gly	Phe	Pro	His	Tyr	Gly	Ile														
305						310				315																			
Val	Lys	Gly	Asp	Tyr	Leu	Met	Ile	Lys	Gly	Cys	Cys	Val	Gly	Pro	Lys														
			325						330					335															
Lys	Arg	Val	Val	Thr	Leu	Arg	Gln	Ser	Leu	Leu	Lys	Gln	Thr	Ser	Arg														
			340						345					350															
Leu	Ala	Leu	Glu	Glu	Ile	Lys	Leu	Lys	Phe	Ile	Asp	Thr	Ser	Ser	Lys														
		355						360					365																
Phe	Gly	His	Gly	Arg	Phe	Gln	Thr	Thr	Asp	Glu	Lys	Gln	Arg	Phe	Phe														
		370						375					380																
Gly	Lys	Leu	Lys	Ala																									
385																													

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<210> 15
<211> 389
<212> PRT
<213> Sorghum vulgare
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<400> 15

Met	Ser	His	Arg	Lys	Phe	Glu	His	Pro	Arg	His	Gly	Ser	Leu	Ser	Phe
1				5					10					15	
Leu	Pro	Asn	Lys	Arg	Ser	Ser	Arg	His	Arg	Gly	Lys	Val	Lys	Ser	Phe
			20					25					30		
Pro	Arg	Asp	Asp	Pro	Lys	Lys	Pro	Cys	His	Leu	Thr	Ala	Phe	Val	Gly
		35					40					45			

Tyr Lys Ala Gly Met Thr His Ile Val Arg Glu Val Glu Lys Pro Gly
 50 55 60
 Ser Lys Leu His Lys Lys Glu Thr Cys Glu Ala Val Thr Ile Ile Glu
 65 70 75 80
 Thr Pro Pro Leu Val Ile Val Gly Leu Val Ala Tyr Val Lys Thr Pro
 85 90 95
 Arg Gly Leu Arg Thr Leu Asn Ser Val Trp Ala Gln His Leu Ser Glu
 100 105 110
 Glu Val Arg Arg Arg Phe Tyr Lys Asn Trp Cys Lys Ser Lys Lys Lys
 115 120 125
 Ala Phe Thr Lys Tyr Ala Leu Lys Tyr Asp Ser Asp Ala Gly Lys Lys
 130 135 140
 Glu Ile Gln Leu Gln Leu Glu Lys Met Lys Lys Tyr Ala Ser Val Ile
 145 150 155 160
 Arg Val Ile Ala His Thr Gln Ile Lys Lys Met Lys Gly Leu Lys Gln
 165 170 175
 Lys Lys Ala His Leu Met Glu Ile Gln Val Asn Gly Gly Thr Ile Ala
 180 185 190
 Asp Lys Val Asp Tyr Gly Tyr Lys Phe Phe Glu Lys Glu Val Pro Val
 195 200 205
 Asp Ala Val Phe Gln Lys Asp Glu Met Ile Asp Ile Ile Gly Val Thr
 210 215 220
 Lys Gly Lys Gly Tyr Glu Gly Val Val Thr Arg Trp Gly Val Thr Arg
 225 230 235 240
 Leu Pro Arg Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly
 245 250 255
 Ala Trp His Pro Ala Arg Val Ser Tyr Thr Val Ala Arg Ala Gly Gln
 260 265 270
 Asn Gly Tyr His His Arg Thr Glu Met Asn Lys Lys Val Tyr Lys Ile
 275 280 285
 Gly Lys Ala Gly Gln Glu Ser His Asp Ala Ser Thr Glu Phe Asp Arg
 290 295 300
 Thr Glu Lys Asp Ile Thr Pro Met Gly Gly Phe Pro His Tyr Gly Ile
 305 310 315 320
 Val Lys Gly Asp Tyr Leu Met Ile Lys Gly Cys Cys Val Gly Pro Lys
 325 330 335
 Lys Arg Val Val Thr Leu Arg Gln Ser Leu Leu Lys Gln Thr Ser Arg
 340 345 350
 Leu Ala Leu Glu Glu Ile Lys Leu Lys Phe Ile Asp Thr Ser Ser Lys
 355 360 365

Phe Gly His Gly Arg Phe Gln Thr Thr Asp Glu Lys Gln Lys Phe Tyr
 370 375 380

Gly Lys Gln Lys Ala
 385

<210> 16

<211> 389

<212> PRT

<213> Triticum aestivum

<400> 16

Met Ser His Arg Lys Phe Glu His Pro Arg His Gly Ser Leu Gly Phe
 1 5 10 15

Leu Pro Arg Lys Arg Cys Ser Arg His Arg Gly Lys Val Lys Ala Phe
 20 25 30

Pro Arg Asp Asp Gln Ser Lys Lys Cys His Leu Thr Ala Phe Leu Gly
 35 40 45

Tyr Lys Ala Gly Met Thr His Ile Val Arg Glu Val Glu Lys Pro Gly
 50 55 60

Ser Lys Leu His Lys Lys Glu Thr Cys Glu Ala Val Thr Ile Val Glu
 65 70 75 80

Thr Pro Pro Ile Val Ile Val Gly Leu Val Ala Tyr Val Lys Thr Pro
 85 90 95

Arg Gly Leu Arg Thr Leu Asn Ser Val Trp Ala Gln His Leu Ser Glu
 100 105 110

Asp Val Arg Arg Arg Phe Tyr Lys Asn Trp Cys Lys Ser Lys Lys Lys
 115 120 125

Ala Phe Thr Lys Tyr Ala Leu Lys Tyr Asp Ser Asp Ala Gly Lys Lys
 130 135 140

Glu Ile Gln Met Gln Leu Glu Lys Met Lys Lys Tyr Ala Thr Val Val
 145 150 155 160

Arg Val Ile Ala His Thr Gln Ile Arg Lys Met Lys Gly Leu Lys Gln
 165 170 175

Lys Lys Ala His Leu Met Glu Ile Gln Ile Asn Gly Gly Thr Ile Ala
 180 185 190

Asp Lys Val Asp Tyr Gly Tyr Asn Phe Phe Glu Lys Glu Val Pro Ile
 195 200 205

Asp Ala Val Phe Gln Lys Asp Glu Met Ile Asp Ile Ile Gly Val Thr
 210 215 220

Lys Gly Lys Gly Tyr Glu Gly Val Val Thr Arg Trp Gly Val Thr Arg
 225 230 235 240

Leu Pro Arg Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly
 245 250 255

Ala Trp His Pro Ala Arg Val Ser Tyr Thr Val Ala Arg Ala Gly Gln
260 265 270

Asn Gly Tyr His His Arg Thr Glu Met Asn Lys Lys Val Tyr Lys Ile
275 280 285

Gly Lys Val Gly Gln Glu Thr His Asp Ala Ser Thr Glu Phe Asp Arg
290 295 300

Thr Glu Lys Asp Ile Thr Pro Met Gly Gly Phe Pro His Tyr Gly Val
305 310 315 320

Val Lys Ala Asp Tyr Leu Met Ile Lys Gly Cys Cys Val Gly Pro Lys
325 330 335

Lys Arg Val Val Thr Leu Arg Gln Ser Leu Leu Lys Gln Thr Ser Arg
340 345 350

Leu Ala Leu Glu Glu Ile Lys Leu Lys Phe Val Asp Thr Ser Ser Lys
355 360 365

Phe Gly His Gly Arg Phe Gln Thr Thr Asp Glu Lys Gln Arg Phe Tyr
370 375 380

Gly Lys Leu Lys Ala
385

<210> 17
<211> 389
<212> PRT
<213> Hordeum vulgare

<220>
<221> misc_feature
<223> Xaa="ANY AMINO ACID SEQUENCE"

<400> 17

Met Ser His Arg Lys Phe Glu His Pro Arg His Gly Ser Leu Gly Phe
1 5 10 15

Leu Pro Arg Lys Arg Cys Ser Arg His Arg Gly Lys Val Lys Ala Phe
20 25 30

Pro Arg Asp Asp Gln Ser Lys Lys Cys His Leu Thr Ala Phe Leu Gly
35 40 45

Tyr Lys Ala Gly Met Thr His Ile Val Arg Glu Val Glu Lys Pro Gly
50 55 60

Ser Lys Leu His Lys Lys Glu Thr Cys Glu Ala Val Thr Ile Val Glu
65 70 75 80

Thr Pro Pro Ile Val Ile Val Gly Leu Val Ala Tyr Val Lys Thr Pro
85 90 95

Arg Gly Leu Arg Thr Leu Asn Ser Val Trp Ala Gln His Leu Ser Glu
100 105 110

Asp Val Arg Arg Arg Phe Tyr Lys Asn Trp Cys Lys Ser Lys Lys Lys
 115 120 125
 Ala Phe Thr Lys Tyr Ala Leu Lys Tyr Asp Ser Asp Ala Gly Lys Lys
 130 135 140
 Glu Ile Gln Met Gln Leu Glu Lys Met Lys Lys Tyr Ala Thr Val Val
 145 150 155 160
 Arg Val Ile Ala His Thr Gln Ile Arg Lys Met Lys Gly Leu Lys Gln
 165 170 175
 Lys Lys Ala His Leu Met Glu Ile Gln Ile Asn Gly Gly Thr Ile Ala
 180 185 190
 Asp Lys Val Asp Tyr Gly Tyr Asn Phe Phe Glu Lys Glu Val Pro Ile
 195 200 205
 Asp Ala Val Phe Gln Lys Asp Glu Met Ile Asp Ile Ile Gly Val Thr
 210 215 220
 Lys Gly Lys Gly Tyr Glu Gly Val Val Thr Arg Trp Gly Val Thr Arg
 225 230 235 240
 Leu Pro Arg Lys Thr His Arg Gly Leu Arg Lys Val Ala Cys Ile Gly
 245 250 255
 Ala Trp His Pro Ala Arg Val Ser Tyr Thr Val Ala Arg Ala Gly Gln
 260 265 270
 Asn Gly Tyr His His Arg Thr Glu Met Asn Lys Lys Val Tyr Lys Ile
 275 280 285
 Gly Lys Val Gly Gln Glu Thr His Asp Ala Ser Thr Glu Phe Asp Arg
 290 295 300
 Thr Glu Lys Asp Ile Thr Pro Met Gly Gly Phe Pro His Tyr Gly Val
 305 310 315 320
 Val Lys Ala Asp Tyr Leu Met Ile Lys Gly Cys Cys Val Gly Pro Lys
 325 330 335
 Lys Arg Val Val Thr Leu Arg Gln Ser Leu Leu Lys Gln Thr Ser Arg
 340 345 350
 Leu Ala Leu Glu Glu Ile Lys Leu Lys Leu Xaa Asp Thr Ser Phe Lys
 355 360 365
 Phe Gly His Gly Pro Phe Gln Asp Thr Asp Glu Lys Gln Arg Phe Phe
 370 375 380
 Gly Lys Leu Lys Ala
 385

<210> 18
 <211> 330
 <212> PRT
 <213> Avena sativa

<400> 18

Trp	His	Glu	Pro	Gly	Ser	Lys	Leu	His	Lys	Lys	Glu	Thr	Cys	Glu	Ala	1	5	10	15
Val	Thr	Ile	Val	Glu	Thr	Pro	Pro	Ile	Val	Ile	Val	Gly	Leu	Val	Ala	20	25	30	
Tyr	Val	Lys	Thr	Pro	Arg	Gly	Leu	Arg	Thr	Leu	Asn	Thr	Val	Trp	Ala	35	40	45	
Gln	His	Leu	Ser	Glu	Asp	Val	Arg	Arg	Arg	Phe	Tyr	Lys	Asn	Trp	Cys	50	55	60	
Lys	Ser	Lys	Lys	Lys	Ala	Phe	Thr	Lys	Tyr	Ala	Leu	Lys	Tyr	Asp	Ser	65	70	75	80
Asp	Ala	Gly	Lys	Lys	Glu	Ile	Gln	Leu	Gln	Leu	Glu	Lys	Met	Lys	Lys	85	90	95	
Tyr	Gly	Thr	Val	Ile	Arg	Val	Ile	Ala	His	Thr	Gln	Ile	Arg	Lys	Met	100	105	110	
Lys	Gly	Leu	Lys	Gln	Lys	Lys	Ala	His	Leu	Met	Glu	Ile	Gln	Val	Asn	115	120	125	
Gly	Gly	Thr	Ile	Ala	Asp	Lys	Val	Asp	Tyr	Gly	Tyr	Asn	Phe	Phe	Glu	130	135	140	
Lys	Glu	Val	Pro	Ile	Asp	Ala	Val	Phe	Gln	Lys	Asp	Glu	Met	Ile	Asp	145	150	155	160
Ile	Ile	Gly	Val	Thr	Lys	Gly	Lys	Gly	Tyr	Glu	Gly	Val	Val	Thr	Arg	165	170	175	
Trp	Gly	Val	Thr	Arg	Leu	Pro	Arg	Lys	Thr	His	Arg	Gly	Leu	Arg	Lys	180	185	190	
Val	Ala	Cys	Ile	Gly	Ala	Trp	His	Pro	Ala	Arg	Val	Ser	Tyr	Thr	Val	195	200	205	
Ala	Arg	Ala	Gly	Gln	Asn	Gly	Tyr	His	His	Arg	Thr	Glu	Met	Asn	Lys	210	215	220	
Lys	Ile	Tyr	Lys	Ile	Gly	Lys	Val	Gly	Gln	Glu	Thr	His	Asp	Ala	Ser	225	230	235	240
Thr	Glu	Phe	Asp	Arg	Thr	Glu	Lys	Asp	Ile	Thr	Pro	Met	Gly	Gly	Phe	245	250	255	
Pro	His	Tyr	Gly	Val	Val	Lys	Gly	Asp	Tyr	Leu	Met	Ile	Lys	Gly	Cys	260	265	270	
Cys	Val	Gly	Pro	Lys	Lys	Arg	Val	Val	Thr	Leu	Arg	Gln	Ser	Leu	Leu	275	280	285	
Lys	Gln	Thr	Ser	Arg	Leu	Ala	Leu	Glu	Glu	Ile	Lys	Leu	Lys	Phe	Val	290	295	300	
Asp	Thr	Ser	Ser	Lys	Phe	Gly	His	Gly	Arg	Phe	Gln	Thr	Thr	Asp	Glu	305	310	315	320

Lys Gln Arg Phe Tyr Gly Lys Leu Lys Ala
325 330